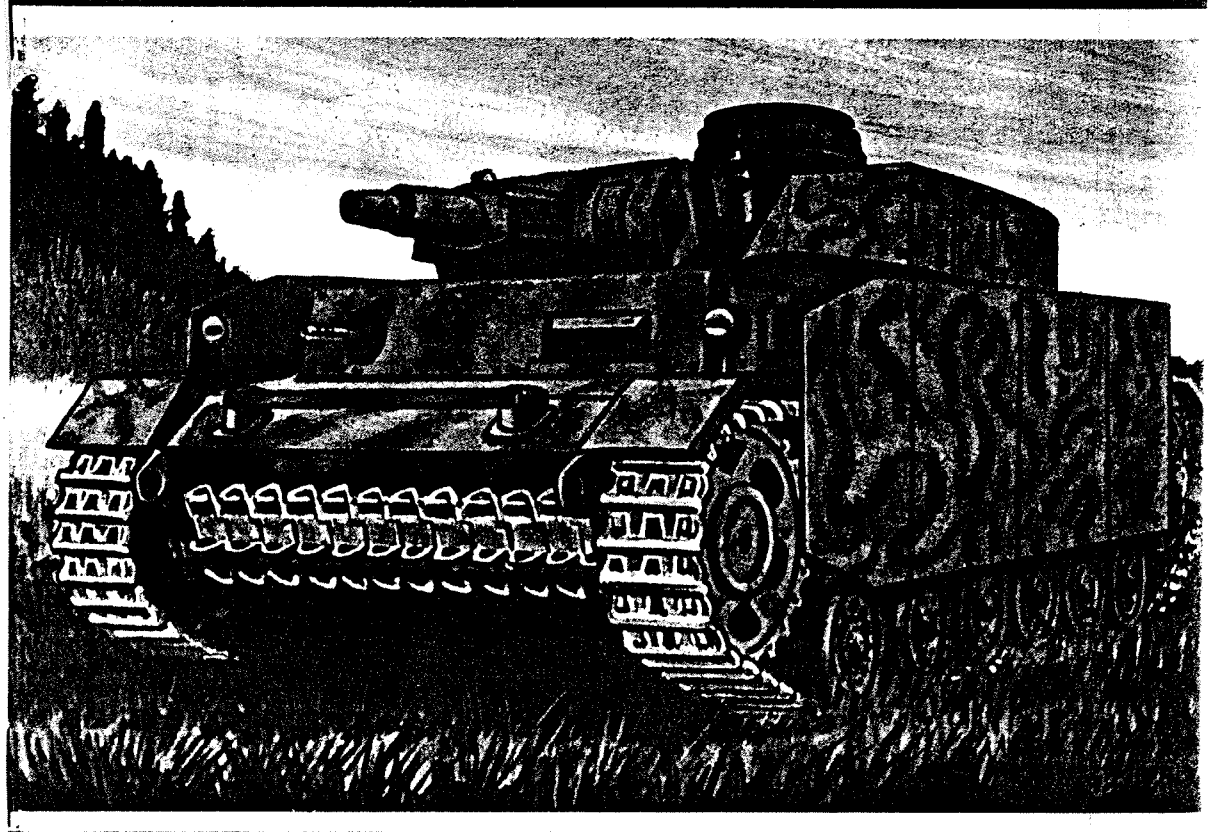
BELLONA

SERIES

20

MILITARY VEHICLE PRINTS



SERIES TWENTY

DETAILED PLAN VIEWS PRESENTED IN 1:76 & 1:48 SCALE

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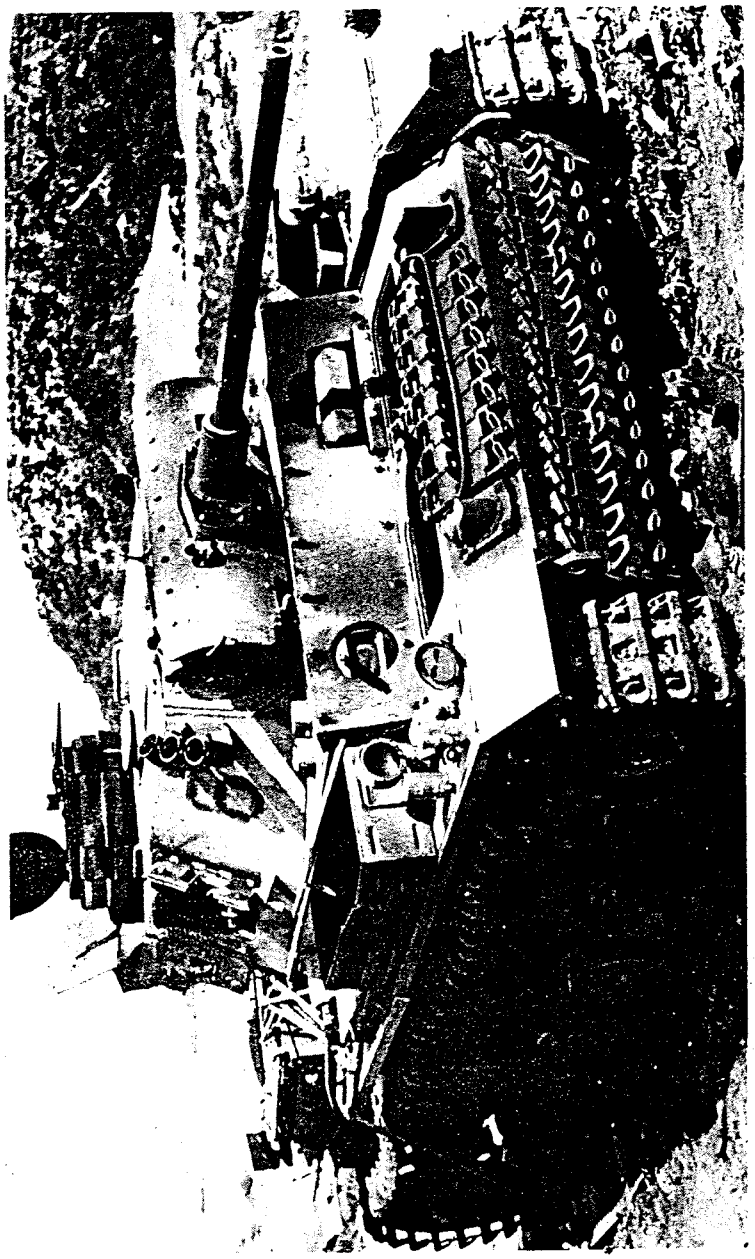

The Ausf. L of the Panzerkampfwagen III, which bore the brunt of most of the fighting in 1942 was superceded by the improved Ausf. M. in 1942/43. This badly damaged Ausf. M. was destroyed in Tunisia in 1943 during the final battles for North Africa. The additional spare track links carried on the nose and the stowage boxes are common features of the vehicles which served in this theatre.

COVER ILLUSTRATION - Drawn by George Bradford.

The 7.5 cm armed version of the Panzerkampfwagen III - the Ausf. N - sometimes known as the Sturmpanzer III was the last production model of this famous tank. It was introduced in 1942 and at first was used to support companies of the then new heavy Panzerkampfwagen 'Tiger' Ausf. E. (Bellona Prints Series 13). The vehicle shown in our cover illustration is fitted with 'Schuertzen' armour plates. This armour plate which was very thin was only intended to detonate hollow charge explosive shells before they reached the main armour of the tank. This fitting was ordered in February 1943. As with all German armoured vehicles issued at this period, the basic vehicle was finished in sand coloured paint and later in the field the crews added whatever additional colour paint was necessary to help it fit in with the surroundings.

Panzerkampfwagen

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Panzerkampfwagen III. - 1941/43. Historical research by Walter.J. Spielberger.

The last of the mass-produced versions of the Panzerkampfwagen III appeared on the battlefields during 1942 and 1943. Initially equipped with the 3.7 cm cannon during the campaigns in Poland and France, the armour and armament of the Panzerkampfwagen III had gradually been improved until late 1941 when the second production run of the Ausf.J. commenced. The Ausf. J at this time was re-equipped with the long barrelled 5 cm KwK 39 L/60. By early 1942 the final development of the basic vehicle as a main battle tank was introduced, this was Ausf. L.

The Ausf. L (9/ZW) (Serial Numbers between 74101 and 76000) came off the assembly lines from the end of 1941 until mid 1942. The frontal armour on both hull and turret was again increased resulting in a total weight of 22,3 metric tons. The fighting compartment was further protected by a 20 mm thick armour plate fixed 100 mm in front of the drivers plate, and provision was also made for the fitting of a similar plate in front of the gun mantlet. Many of the early production vehicles went into battle without this additional mantlet plate. All but the earliest models of the Ausf. L. production run had the loader's vision port in the mantlet and the ports in the turret sides deleted. An Ausf.L. with chassis number 74375. examined by British Intellegence still had the hull escape hatches. However, Number 74400 had none. Special preparations were made to make many of these tanks suitable for operations in dusty and desert conditions, such vehicles were designated Ausf. L (Tp) (Tp = Tropical). The modifications involved included, air cleaners that aspirated from the fighting compartment through the engine bulkhead, and the fitting of curved deflector plates below the rear outlets and exhaust pipes. These tanks were used in most of the major tank battles fought in Russia and North Africa during 1942. However, it was not until mid July that the first tank fitted with the spaced armour was captured in North Africa.

In May of 1942 Hitler ordered that the production of the Panzerkampfwagen III be increased to 190 units per month and in the following July he ordered that the obsolete 7.5 cm KwK L/24 cannon be fitted in place of the 5 cm cannon. Meanwhile the Ausf. M (10/ZW) (Serial Numbers between 76001 and 78000) was entering production.

The Ausf. M. differed from the Ausf. L. in only detailed points and can be considered as an improved model of the former vehicle. The deletion of the hull escape hatches allowed redistribution of the ammunition stowage and thus an increase in the number of rounds of 5 cm ammunition from 78 to 98. Some of this increased capacity was gained at the expense of MG ammunition which was reduced from 4950 to 2550 rounds.

The most significant development introduced with the Ausf. M were the facilities for deep wading. British examination reports indicate that the Ausf. M could wade to a depth of approximately 4' 3" (130 cm) however, additional fittings and sealing suggests that these Panzerkampfwagen III could wade to the top of the hull about 5' 0" (152 cm) For this purpose, a new type of exhaust silencer was mounted high up on the upper tail plate. The exhaust gases were expelled through a spring loaded valve at the top of the silencer. The air outlet beneath the tail plate was sealed by a plate with two hinged flaps connected by cables to the inside of the vehicle so that they could be opened from within the fighting compartment. Air intakes on the engine access hatches had metal plates with rubber seals underneath the armoured covers. In a similar fashion, the air intakes at each side of the engine compartment were rendered watertight by the fitting of special sealing plates. All these sealing plates were normally held in an open position by springs. To prepare for wading the sealing plates were depressed by the application of manual pressure to the heads of the plunger locks fitted in each one.

While locking was a manual operation all seals could be released by, cable control from the fighting compartment. The air intakes for the cooling of the final drive and steering brakes on the front nose of the vehicle were sealed by the insertion of rubber plugs secured by 'U' clamps. During wading all air was drawn through the fighting compartment. Special attention was paid to the sealing of all vision ports on the hull, while all electrical cables were housed in watertight metal conduit. The headlights, formerly found on the hull front, now of the new pattern, were mounted high up on the fenders and were detachable. The smoke dispensing units which formerley were fitted beneath the upper tail plate now were replaced by dischargers on the turret sides.

An additional modification which appears to have been fitted for the first time on the Ausf. M. was a system of valves allowing the transfer of heated engine coolant from one vehicle to another. (Similar fittings were incorporated on the Panzerkampfwagen IV Ausf. G.) The system of operation was described in manuals and can be summarised as follows: The warm vehicle was parked tail to tail with the cold one, the radiator shutter closed and temperature brought to 60 degrees, when the engine was turned off, hoses were then connected to the cold vehicle, the engine of the warm vehicle was then restarted and was

The Ausf. L of the Panzerkampfwagen III, which bore the brunt of most of the fighting in 1942 was superceded by the improved Ausf. M. in 1942/43. This badly damaged Ausf. M. was destroyed in Tunisia in 1943 during the final battles for North Africa. The additional spare track links carried on the nose and the stowage boxes are common features of the vehicles which served in this theatre.

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allowed to run at about 2000 rpm. The hot coolant then circulated with that of the cold vehicle. When the overall temperature again reached 50 degrees the engine of the cold vehicle was started. This operation took about 12 to 15 minutes when the cold vehicle was at minus 30 degrees.

Production of the Ausf.M. continued until early 1943 but only 22 examples were completed early that year. However, one hundred vehicles of the Ausf.M. series were delivered by the MIAG Company of Braunschweig to Waggonfabrik Wegmann AG of Kassel for conversion to flamethrower tanks during 1943. Their official designation was 'Panzerkampfwagen III (Fl) Sd.Kfz. 141/3' In place of the 5 cm main armament they had the flamethrower barrel. This flamethrower was powered by a DKW 2 stroke petrol engine. Range was about 60 metres depending upon weather conditions. 220 gallons (1000 Litres) of flamefuel was carried, the consumption was about 8 litres per second, giving about 125 one second bursts. Additional 20 mm Plates were welded to the front of these tanks to further improve protection. The crew was three men. These vehicles were mainly issued to special outfits on the East front during 1943.

Photographic evidence reveals that a Panzerbeobachtubgswagen III' observation tank was based upon the Ausf.M. Additional vision and pistol ports were located at the rear of the fighting compartment, on the hull sides, and on the turret sides. The MG positions both hull and turret were deleted in favour of extra vision ports. That on the turret front was similar to the drivers visor, half of the mantlet being cut away to accomodate it. The main additional radio antenna, of the mast type, was located at the rear of the engine covers between the air intakes.

The Panzerkampfwagen III were produced during this period by the companies of Alkett, Daimler-Benz, FAMO, MIAG, Wegmann and MNH.

As mentioned previously, as early as July 1942, Hitler had ordered that 7.5 cm L/24 cannons to be fitted in the Panzerkampfwagen III. A proportion of the Ausf. L production appears to have allocated for this purpose, certainly by late 1942, 7.5 cm armed Panzerkampfwagen III Ausf. L. were in action as support tanks for Tiger companies. Such units operated with the Tiger company sent to Tunisia in early 1943. At a later date tanks returned to the workshops for major overhaul, were similarly modified. These vehicles were identical to the Ausf.L 5 cm KwK 39 L/60 in our drawing, but no hull escape hatches were fitted, and of course the main armament was the short 7.5 cm, 56 rounds of 7.5 cm ammunition and 3450 rounds of MG ammunition were carried. At least three examples of these tanks remain in existance today, one in the Aberdeen Proving Ground, one in the R.A.C.Tank Museum in Bovington, and another in Copenhagen, Denmark. The 7.5 cm Guns used in these tanks were those that had been removed from the early models of the Panzerkampfwagen IV.

The final version of the Panzerkampfwagen III, the Ausf. N - Sd.Kfz 141/2 remained in production in small numbers until August 1943. The armament was exclusively the 7.5 cm KwK L/24. During this series facilities were gradually re-utilised in the production of the Sturmgeschuetz vehicles based upon the Panzerkampfwagen III chassis. The Ausf. N was essentially similar to the Ausf. M. being fully equipped for deep wading and having the fittings for transfer of coolant from one vehicle to another. The final drive and steering brake hatches were now completely removable when unlocked from inside, as they were no longer hinged. The split hatches of the Commanders cupola was replaced by the single piece cover that appeared on the Panzerkampfwagen IV Ausf. H about the same time.
No vehicles armed with the 7.5 cm cannon had spaced armour fitted on the mantlet. Ammunition stowage was again modified to accomodate additional rounds, and a total of 64 - 7.5 cm rounds were carried. A total of 660 of the 7.5 cm armed vehicles were built, 447 of these between July and December 1942, and the remaining 213 between then and August 1943.
These final models received extra protection in the form of 5 mm spaced armour around the turret and 8 mm plates hung on the sides of the tank, this was the so called 'Schuerzen' (Apron) armour. Similar to many other vehicles produced at that time they were also coated with 'Zimmerit' anti-magnetic mine pastem of which 220 Lbs (100 Kg) were required to coat one Panzerkampfwagen III. The improved mounting for the anti-aircraft machine gun on the Commanders cupola was provided, but was not used very frequently (Bellona Prints, Series 16). To decrease the ground pressure of vehicles operating in soft terrain, the wide section 'Ostkette' (East tracks) were made available. When fitted they increased the overall width of the vehicle to 10' 9" (326 cm) however, this was only a makeshift arrangement. (Ostkette are shown on a Panzerkampfwagen IV Ausf. J in Bellona Prints Series 6, No.22 GE)

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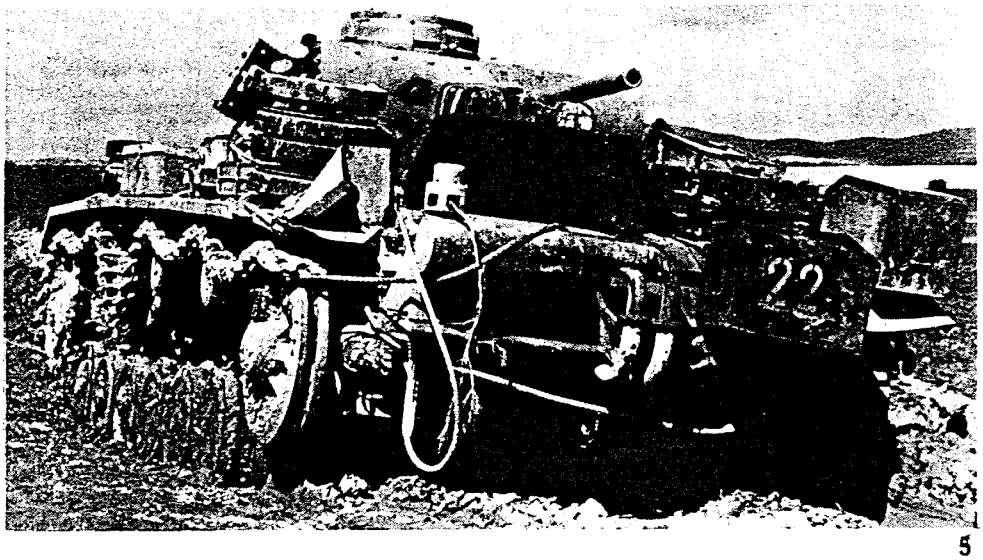
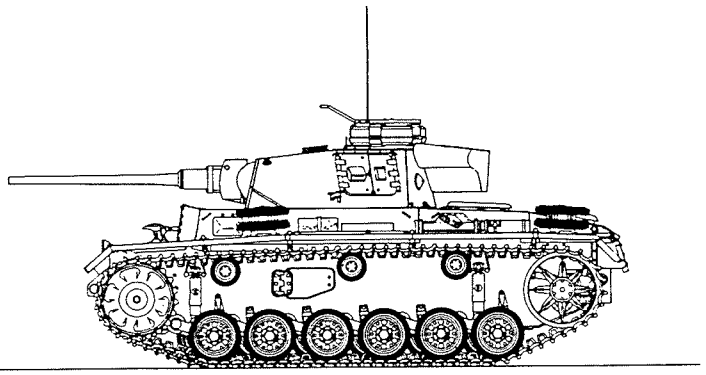
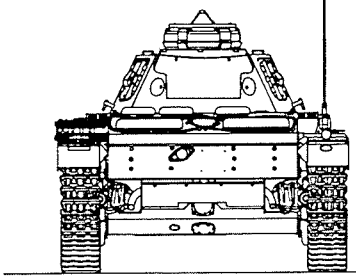
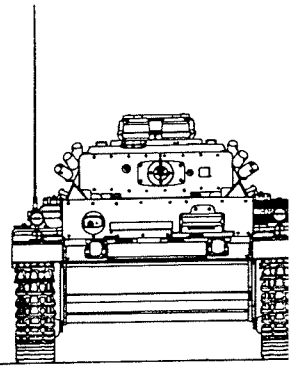
ABOVE: Photographed in Russia, this vehicle represents an interesting version of the Panzerkampfwagen III Ausfuehrung L. While the hull escape hatch has been deleted and spaced armour is fitted indicating that it is an Ausf. L. the turret appears to be that of an Ausf. J. as the vision ports on both the turret sides and gun mantlets are still retained, and no form of spaced armour attachment appears to have been fitted to the gun mantlet. This suggests that it is an early example, however, early models of the Ausf. L (Tp) captured by the British forces in North Africa were the exact opposite, having a hull escape hatch but no turret vision ports. During the Russian winter, tanks were painted with a form of whitewash so that they blended in with the snowy conditions. (Bellona Warpics photograph)

BELOW: Again in North Africa this Ausf. M was photographed after it had been abandoned due to a shed track. The modified exhaust pipe and silencer fittings are clearly seen on the back plate. Also of interest in this photograph are the vast number of additional containers attached to the vehicle, obviously fitted after delivery. (Imperial War Museum Photograph)



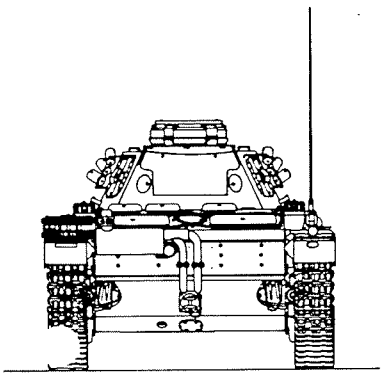


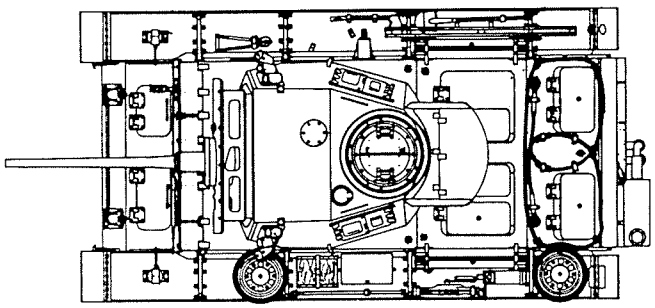


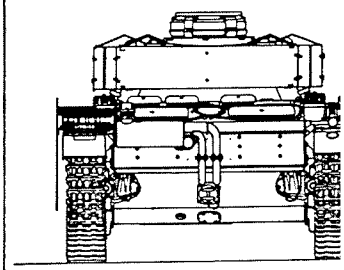


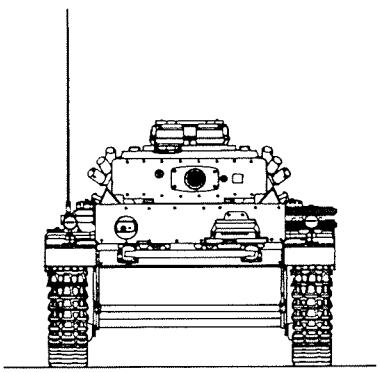
PANZERKAMPFWAGEN III AUSF. L .

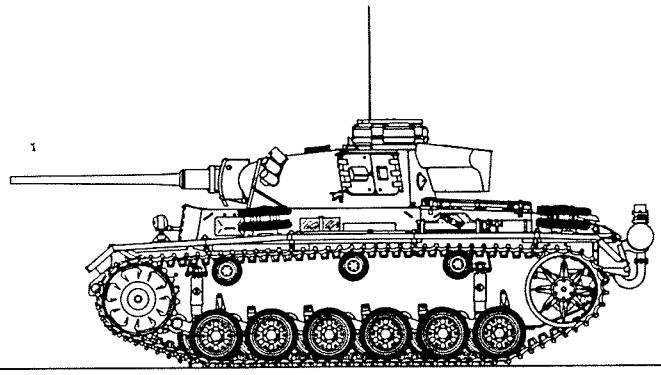
PANZE

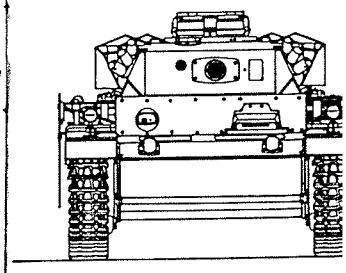








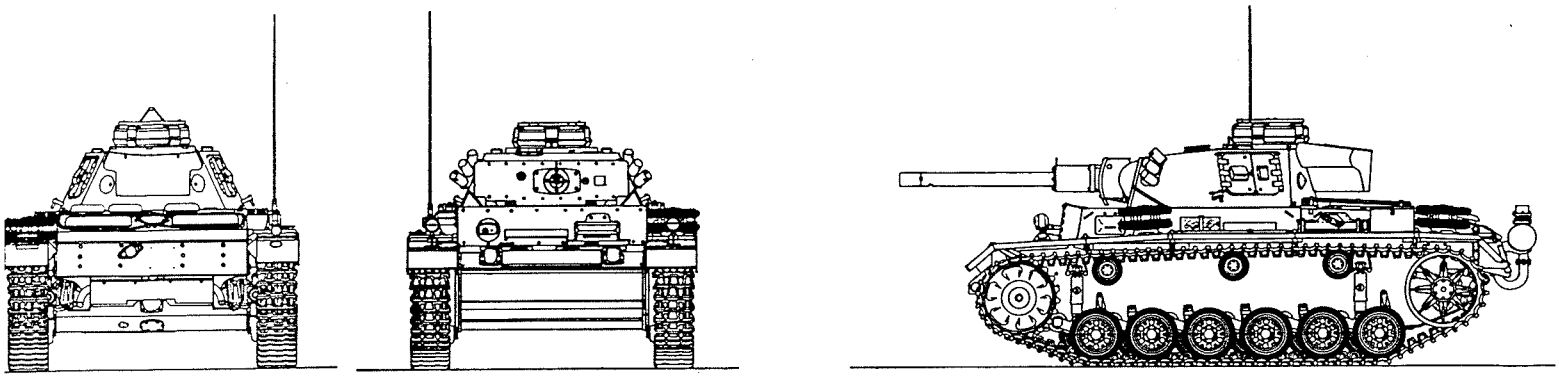




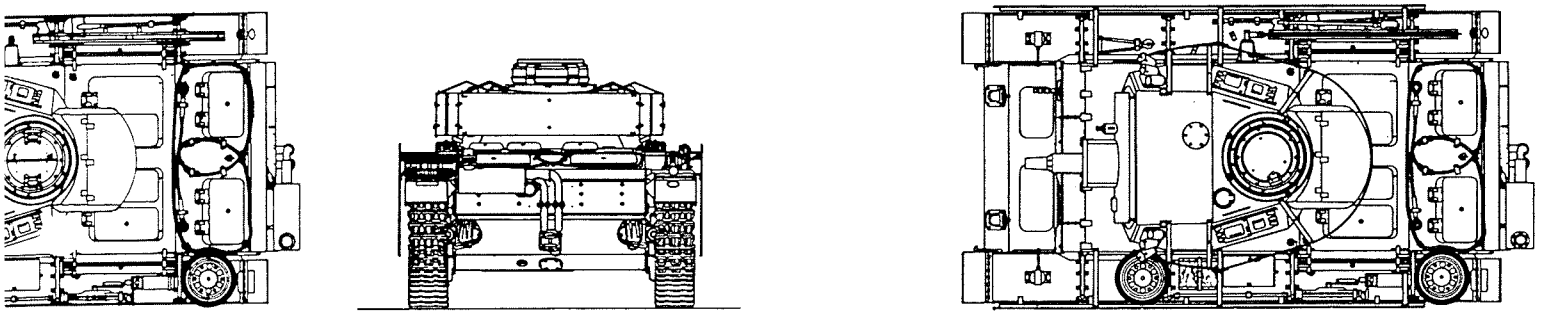
PANZERKAMPFWAGEN III AUSF. M.

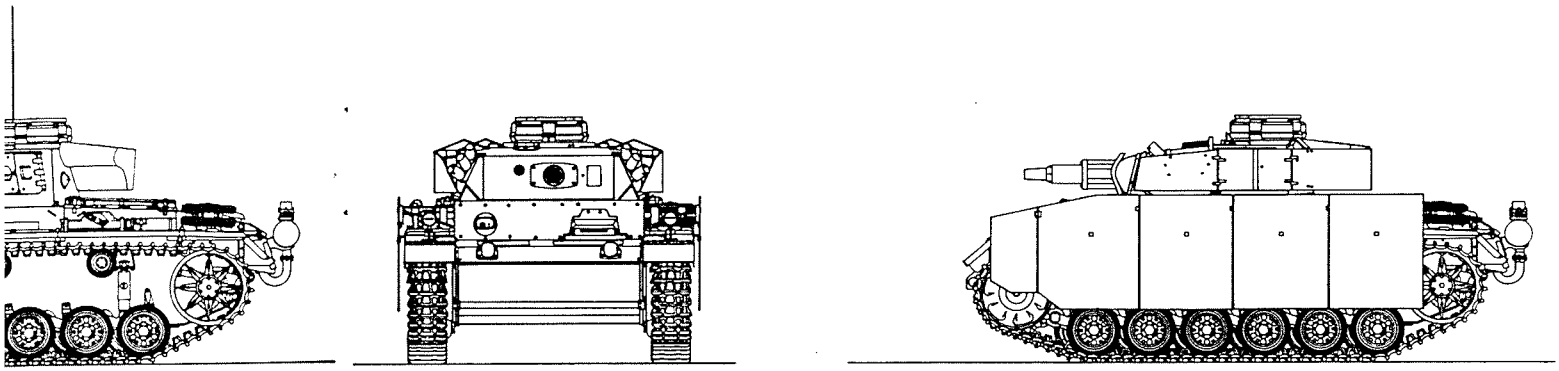
PANZE

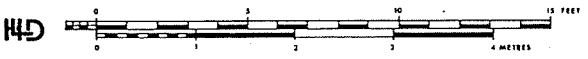
SCALE 1:76 (4mm to 1foot) DRAWN BY H.L.DOYLE.



PANZERKAMPFWAGEN III Flamm.

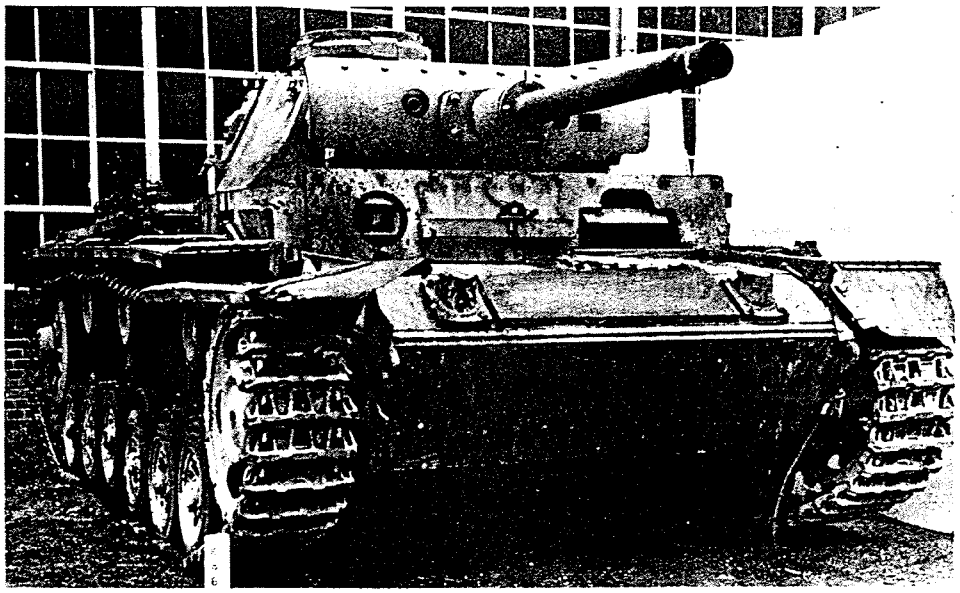






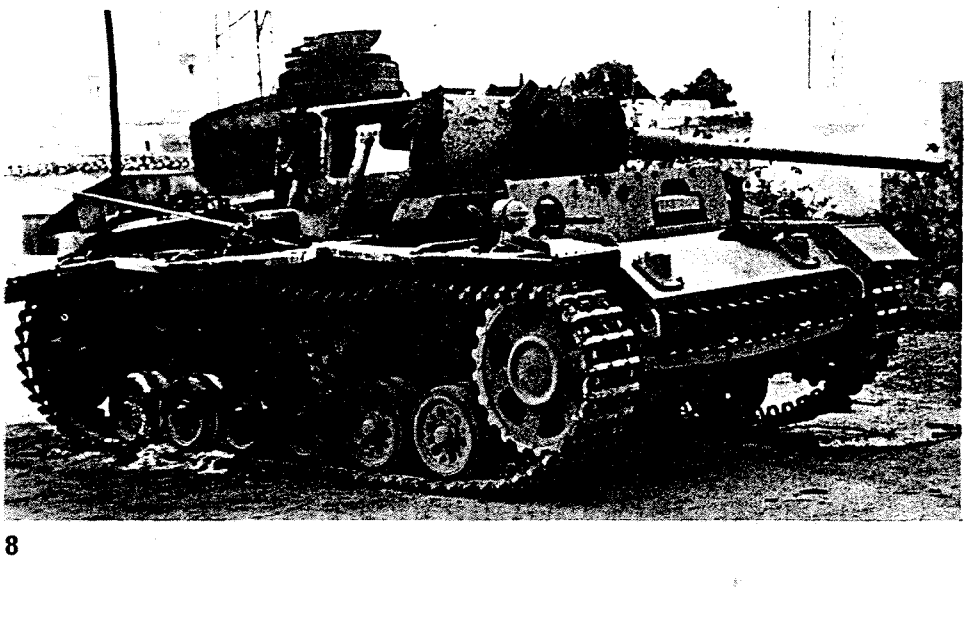
PANZERKAMPFWAGEN III AUSF. N.

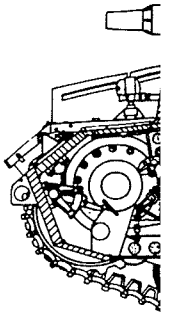
SCALE 1:76 (4mm to 1foot) DRAWN BY H.L.DOYLE.



ABOVE: The bulk of these 'Panzerkampfwagen III (Fl)' of Flammpanzer III's were used on the Russian front. The recognition feature is the actual flame projector barrel which is much wider that the 5 cm KwK 39 of the Ausf. M. The base sleeve of the barrel is particularly noticeable as it is the full size of the protector box. This vehicle in our photograph was captured and examined by the American Forces. Note the additional armour welded on the upper and lower nose of the tank and the spaced armour plates normally fitted to all Ausf. M and most of the Ausf. L vehicles. Another interesting point is the chassis number Nr: 77651 painted on the front plate above the MG ball mounting. (Official U.S. Photograph)

BELOW: This burned out Ausf. M was destroyed in Tripoli in January 1943. The modifications made to the Ausf. M. to enable these tanks wade to a greater depth are the features which distinguish it from former models such as the Ausf. L. The main points to note are: headlamps of a new pattern mounted high up on the dustguards, smoke dischargers on the turret sides, sealing plate attachments to the side air intakes for the engine and the completely modified exhaust and silencer arrangement on the rear tail plate. (Imperial War Museum Photograph)





Technical Specification for Pa

Crew: 5.
Weight, Combat loaded: 4658
23.2

Performance

Speed, Max. Road: 24.85
Cross Country: 11. 8
Max. Gradient: 30 deg
Fording depth: 4' 3"
Trench crossing: 7' 2½"
Step: 1' 11½"
Min. Turning circle: 19' 3'
Ground pressure: 14.65
Range (internal fuel), Road:
Cross country:
Power to weight ratio:

Dimensions

Length overall: 21.5½'
Length: 18' 11
Width with apron: 11' 2½'
Width: 9' 9'
Height: 8' 2½'
Ground clearance: 1' 3½'
Fire height of gun: 6' 2¾'
Turret ring dia: 4' 11'
Road wheel dia (overall) 1' 9'

Trackwork

Centres: 8' 2¾'
Length on ground: 9' 4½'
Width: 1' 3¾'
Number of links per track:

Mechanical Details

Engine: 1 x Maybach H
OHV watercool
265 bhp at 260

Transmission: ZF SSG77WrA
Steering: Clutch and Bral
Suspension: One torsion bar
rearwards on le

Armament

Main: 1 x 5 cm KWK
Calibre, and length in calibres
Traverse: 360 degree turr
Elevation: plus 20 degrees
minus 6 degrees
Secondary armament: 1 x 7.9
1 x 7.9
6 x 9 cm
1 x 27 m

used on the Russian
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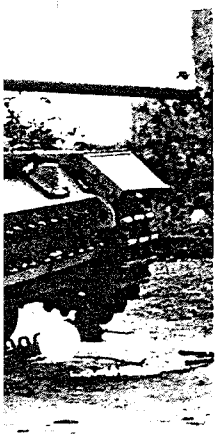
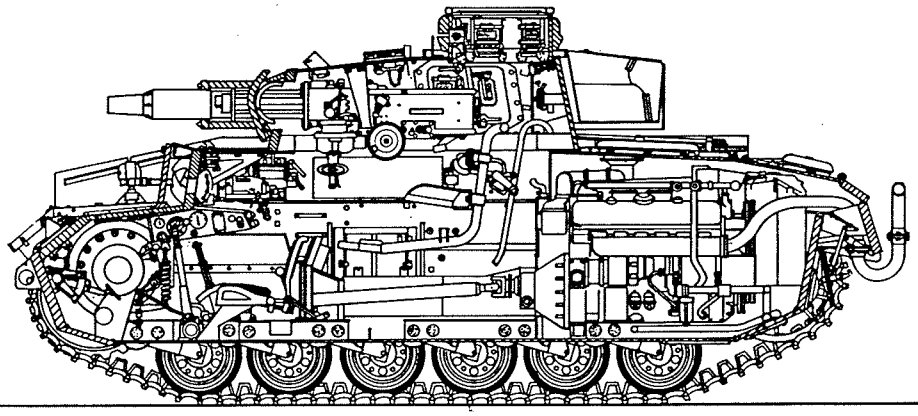




Technical Specification for Panzerkampfwagen III Ausf.M. (10/ZW)

Crew: 5.
Weight, Combat loaded: 46585 lbs. 20.8 Long tons.
23.29 Short tons; 21.13 Tonnes.

Performance

Speed, Max.Road:	24.85 m.p.h. (40 Km.p.h.)
Cross Country:	11. 8 m.p.h. (19 Km.p.h.)
Max. Gradient:	30 degrees.
Fording depth:	4' 3" (130 cm)
Trench crossing:	7' 2½" (220 cm)
Step:	1' 11½" (60 cm)
Min.Turning circle:	19' 3" (5.85 metres)
Ground pressure:	14.65 lbs/sq.ins (1.03 Kg/sq.cm)
Range (internal fuel), Road:	93.3 Miles (155 Km)
Cross country:	59 Miles (95 Km)
Power to weight ratio:	11.5 Metric HP/ton

Dimensions

Length overall:	21.5¾" (655 cm)
Length:	18' 11½" (578 cm)
Width with apron:	11' 2½" (341 cm)
Width:	9' 9" (297 cm)
Height:	8' 2½" (250 cm)
Ground clearance:	1' 3½" (38.5 cm)
Fire height of gun:	6' 2¾" (190 cm)
Turret ring dia:	4' 11" (150 cm)
Road wheel dia (overall)	1' 9" (53.3 cm)

Trackwork

Centres:	8' 2¾" (251 cm)
Length on ground:	9' 4½" (286 cm)
Width:	1' 3¾" (40 cm)
Number of links per track:	93.

Mechanical Details

Engine: 1 x Maybach HL 120 TRM Ausf A. V.12 (60 degrees) OHV watercooled Petrol of 11.867 litres developing 265 bhp at 2600 rpm and 300 bhp at 3000 rpm.

Transmission: ZF SSG77WrA 705 with 6 forward and 1 reverse ratio.
Steering: Clutch and Brake.
Suspension: One torsion bar to each road wheel, swing arms act rearwards on left hand side, forward or right hand side.

Armament

Main: 1 x 5 cm KWK 39
Calibre, and length in calibres: 50 mm (1.968 ins), L/60.
Traverse: 360 degree turret. Operation: Hand.
Elevation: plus 20 degrees, minus 10 degrees to front and sides, minus 6 degrees to rear.
Secondary armament: 1 x 7.92 MG 34 coaxial
1 x 7.92 MG 34 Hull.
6 x 9 cm Nb K.wg - smoke dischargers.
1 x 27 mm signal pistol.

Sights Main: TZF 5 e. Secondary: TZF 2.

Communications

1 x FU 5. - 10 watt transmitter c Ultra shortwave receiver e. operating on the 27200 - 33300 Kc/s band.

Stowage

Ammunition, main armament: 5 cm 98 rds.
Ammunition, secondary armament: 7.92 mm - 17 x 150 rd belts.
Signal: 24 rds.
Internal Fuel capacity: 70.44 Imp. gals. 84.54 U.S. gals. 320 litres.

Armour

Hull,	Nose upper:	1.968" (50 mm) at 40 degrees.
	Nose lower:	1.968" (50 mm) at 70 degrees.
	Glasis plate:	0.984" (25 mm) at 6 degrees.
	Drivers plate:	1.968 + 0.780" (50 + 20 mm) at 81 degrees.
Sides,		1.176" (30 mm) at 90 degrees.
Apron:		0.384" (10 mm)
Rear, upper + lower		1.968" (50 mm) at 73 + 81 degrees.
Decking:		0.708" (18 mm) at 0 degrees.
Engine covers:		0.708" (18 mm) at 2 + 11 degrees.
Belly, Front:		0.624" (16 mm) at 0 degrees.
Turret	Front:	2.244" (57 mm) at 75 degrees.
	Sides:	1.176" (30 mm) at 65 degrees.
	Rear:	1.176" (30 mm) at 78 degrees.
	Roof:	0.384" (10 mm) at 7 + 0 degrees.
Mantel:		1.968 + 0.780" (50 + 20 mm) rounded
Cupola:		1.764 - 2.160" (45 - 55 mm)

German Standard Angles: 0 degrees = Horizontal

Variation for Panzerkampwagen III. Ausf. L. (9/ZW)

Weight: Combat loaded. 22.3 tonnes
Fording depth: 2' 6½"(80 cm)
Length overall: 21' 0" (641cm)
Length: 18' 1½" (552cm)

Variation for Panzerkampfwagen III. Ausf. N. (11/ZW)

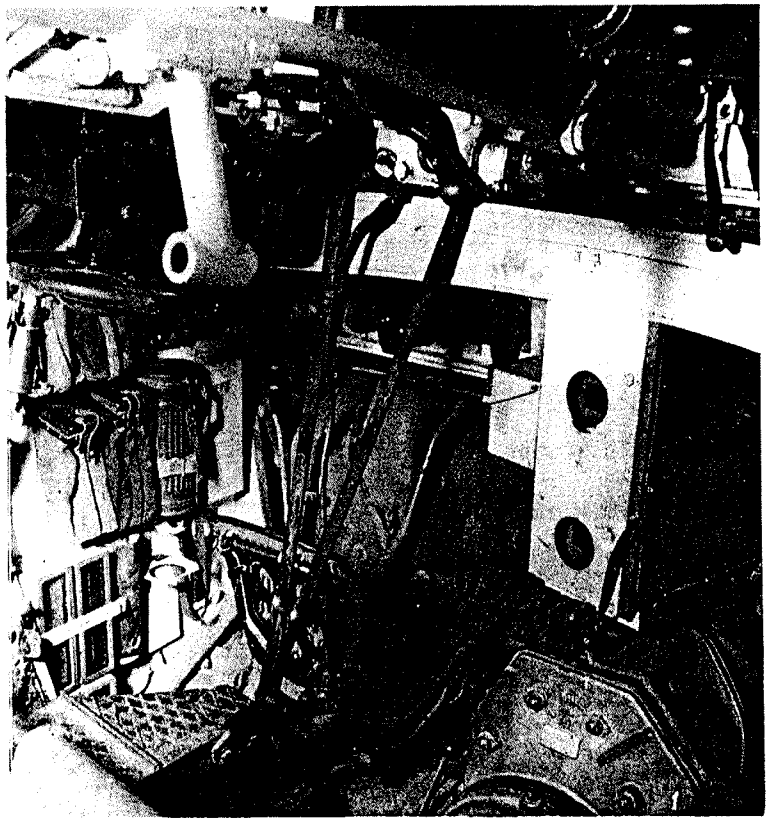
Weight: Combat loaded. 21.3 tonnes.
Length overall: Production Ausf. N. 18' 11½"(578cm)
Converted Ausf. L. 18' 1½" (552cm)

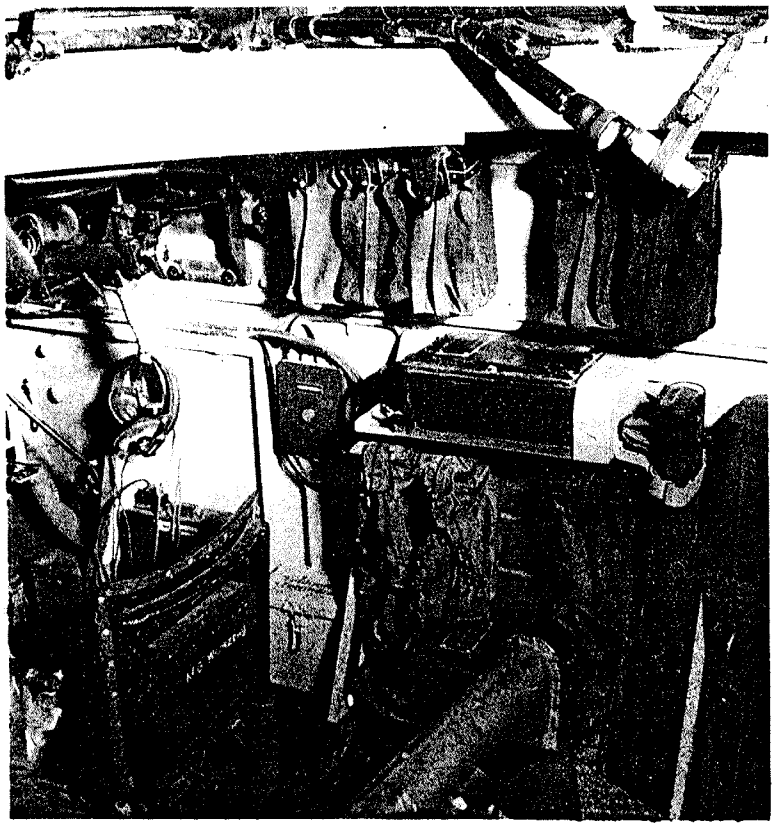
Armament

Main: 1 x 7.5cm KwK.
Calibres length and calibre: L/24(7.5cm)(2.952ins)
Elevation: plus 20 degrees, minus 8 degrees 17 minutes.
Sights; 1 x TZF 5 f.

Stowage

Ammunition, main armament: Production Ausf. N - 7.5cm 64 rounds. Converted Ausf. L - 7.5cm 56 rounds.
Secondary: 7.92mm 23 x 150 round belts.





The internal stowage in an Ausf. L. on the left is a view showing the drivers position as seen from beneath the main armament. On the hull wall are MG ammunition bags and a gas mask, below these bags are two spare glass blocks for the drivers vision slit. The slit is just beneath the turret ring, but the armoured visor is closed and the binocular periscopes are in place. To the left in the corner is a gyrocompass and to the right, over the gearbox, are the radio mounting racks and instrument panel. The position of the barrel of the long gun is indicated to the driver by two lights one to each side of the vision slit, so that when the gun is outside the track width the respective light is switched on automatically.

On the right is the radio operators seat and above the seat are the sights and pistol grip of the hull MG 34. Beneath the turret ring on the side wall are five MG ammunition bags of a seven bag row and beneath them some of the electrical equipment associated with the radio sets. A further four bags of MG ammunition are carried in a rack beneath this fitting. To the side of which is fitted a container for spare MG barrels. Behind all this equipment is the side hull escape hatch which suggests that while these hatches were retained on these early Ausf.L. they were not used at all. The chassis number of this vehicle is 74375. (Imperial War Museum Photograph)

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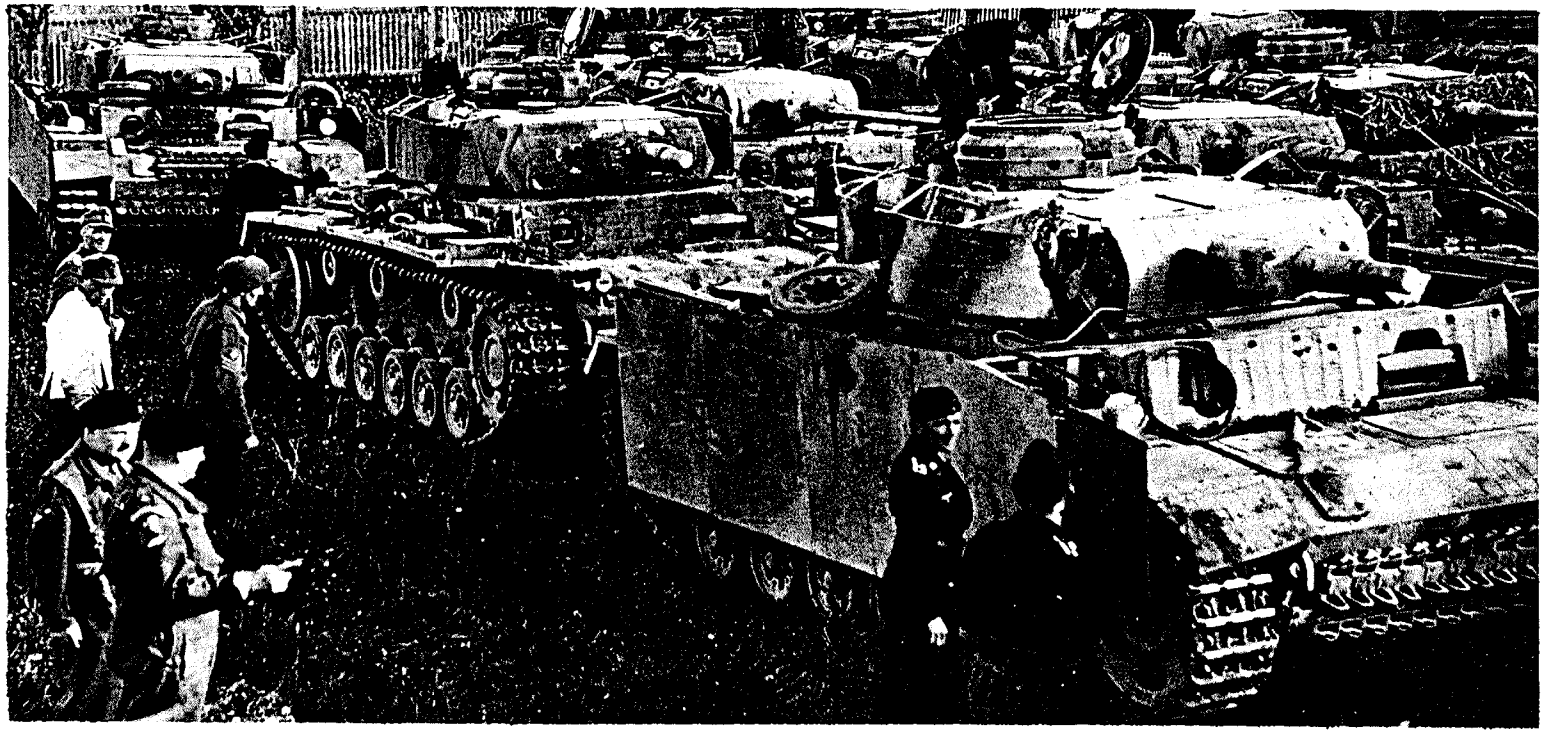
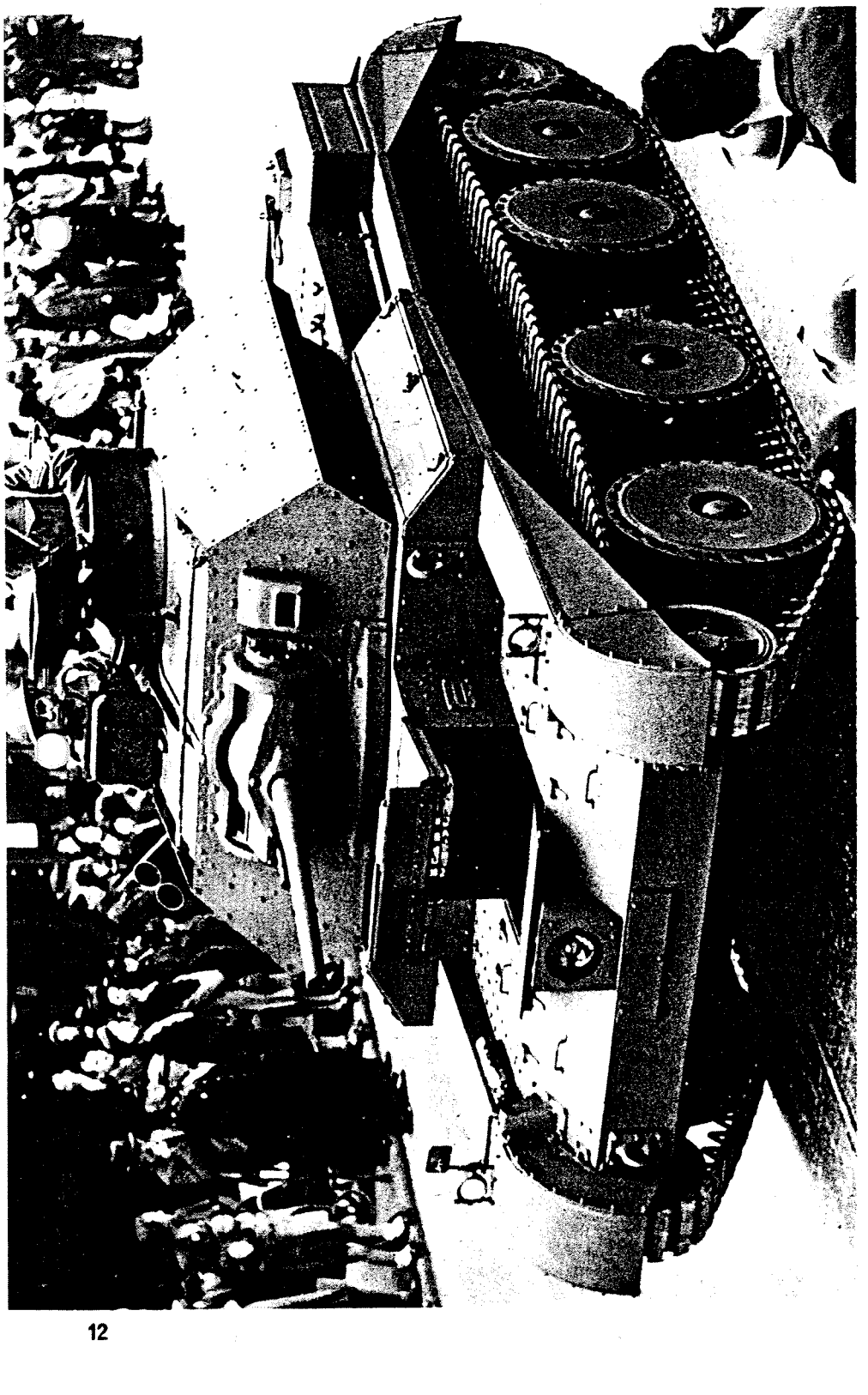


A most interesting picture of the surrender of some of the German tanks in Norway on the 10th June 1945. These vehicles were turned over to Allied authorities outside Oslo. The vehicle in the foreground is a production Ausf.N. complete with 'schuerzen' plates and 'zimmerit' Note the single piece hatch cover on the cupola and the lack of hinges on the access hatches to the final drive and steering brake units. The vehicle directly behind is an Ausf.L. converted to Ausf.N. configuration by the fitting of the 7.5 cm cannon - note the headlamps on the nose plate and the open air intakes on the engine sides. The normal two piece cupola hatch appears to have been replaced by a single piece one. In the background are various other models; directly behind the first mentioned vehicle is another Ausf.N. and behind it an Ausf.M or L. which is covered by a camouflage net. Behind the second vehicle is an Ausf.J. recognisable by the lack of spaced armour and the vision port on the right side of the gun mantlet. (Official U.S. Photograph)



A Cruiser Tank Mark IV on parade in Britain in late 1940. This tank is T 7034, one of the 31 of this type produced by L.M.S. to an order dated January 1939. Spaced armour can be clearly seen and the round Commanders cupola. (Imperial War Museum Photograph)

BELLONA PRINTS.

CRUISER TANK A 13

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A Cruiser Tank Mark IV on parade in Britain in late 1940. This tank is T 7034, one of the 31 of this type produced by L.M.S. to an order dated January 1939. Spaced armour can be clearly seen and the round Commanders cupola. (Imperial War Museum Photograph)

CRUISER TANK A 13 - 1937/41

In Sept. 1936, three months after Lt.Col.G le Q Martel took up the appointment of Assistant Director of Mechanisation, he accompanied Maj.Gen.A.P.Wavell to the Red Army manouvres. He was greatly impressed by the performance of the Russian BT tanks which employed 'Christie' suspension. Subsequently, Martel wrote to the Director of Mechanisation praising the BT's mobility and later suggested the need for a faster, heavier tank than the then current cruiser tank, A9 (Bellona Print, Series 17, No.65. UK). Gen. Sir Hugh Elles did not approve, because he was mainly concerned with Infantry tanks. Full credit must therefore be given to Martel for his persistence which was later rewarded when designs were started for new 'light medium' and heavy medium' tanks. Rapid progress was made with the 'light medium' tanks. The War Office did not like the idea of buying a BT tank from the Russians, so one alternative was to try to buy one of the originals from the USA and develop it as the Russians had done.
In October the Assistant Director of Mechanisation for wheeled vehicles, suggested that Martel ask Oliver Boden, an ex-Vickers man at the Nuffield Company of Morris Commercial Cars, to contact J.Walter Christie in New Jersey, which he did by telephone. Boden had previously made the War Office aware of the Christie tank.
Earlier, Lord Nuffield had had a disagreement with the Air Minister because an anticipated large production order for Wolseley Aero-Engines had not materialised. Despite several re-designs of their engines they seemed unable to keep up with fast growing requirement changes and in consequence Lord Nuffield turned his interest to tanks.

The US Ordnance Dept. had dropped the Christie tank after several years trials because of lack of reliability although Christie had first demonstrated his famous suspension as early as 1927. Christie had only one tank left. It was agreed to buy this for £8000. When the tank arrived at New York for shipment to the UK it was found to have a lien on it which the War Office had to pay. Discovery of this shipment by the US authorities forced the imposition of the embargo on export of war material to comply with US Neutrality Act. So to overcome this difficulty the hull was shipped as a 'tractor' and the turret and other parts crated and labelled 'grapefruit'

The Christie tank arrived in the UK on 17th November 1936 and three days later Lord Nuffield attended a meeting at the War Office where he agreed to buy the patent rights from Christie and undertake development of the tank.

Trials of the "Christie" took place during the winter of 1936-37. When it became clear that the two main advantages of the design were the power to weight ratio and the suspension. The engine which was light and powerful, was based on the American Liberty aero-engine of WW.I which gave it a top speed of 45 mph The suspension consisted of large diameter road wheels each independently sprung enabling the vehicle to roll more easily over rough ground. Further advantages were reduced rolling resistance whilst the large wheel up-and-down movement and slower rotation enabled shock of fast movement to be withstood.

A considerable amount of re-design work was necessary, for in order to mount a 2-pdr gun it was essential to widen the vehicle and either make it longer or higher. By Jan. 1937 the general layout of the design had been settled and work commenced on two pilot models. J.Walter Christie came over early in the year and advised on the use of a 10" pitch track, but when Lord Nuffield saw it on the first pilot, completed in November, he insisted that it would set up too great a stress on the track plates and his engineers were instructed to start on the design of a new track with a pitch as close to $1\frac{1}{2}$" as they could.

The Nuffield Mechanisation & Aero Company was registered in Sept. next door to the Wolseley plant in Birmingham and additional new buildings were ready early in 1938.

Martel had been keen to try aero-engines in tanks as the Russians had done and had discovered a stock of 600 Napier Lion 500 hp engines, classified obsolete by the R.A.F. which could be bought quite cheaply. In Oct. 1936 he suggested one of these should be bought and used for trials. The Director of Mechanisation refused persission on the grounds that £500 expenditure might be wasted. Months later permission was granted, but the engines were no longer available. The engine problem was later solved by the discovery of six stored Liberty aero-engines and some of the drawings, so Nuffield engineers completed a full set of drawings and set about producing the Nuffield-Liberty engine. Further difficulties arose in the supply of armour plate and at first this was solved by getting supplies from Austria.
The pilot model weighing 12 tons, mounted a 2-pdr and with a 14 mm armour basis was 2 tons heavier than the "Christie". The 350 HP Liberty engine gave it a top speed of 30 mph. Considerable difficulties were experienced due to the increased weight. Trouble was also found in some of the main components and a completely re-designed air induction, ignition and cooling systems, new tracks with conventional sprocket drive, clutch and brakes and strengthening of gear components was required along with the fitting of hydraulic shock absorbers. A third pilot was built incorporating these features.

Performance was sufficiently promising for Martel to suggest two pilots of a 'Medium' tank to be built and developed from it. The Director of Mechanisation again refused, though the Finance Department agreed to the project.

Despite the teething troubles of the pilot, 65 tanks were ordered in Jan. 1938. Further minor troubles continued through the Summer and in September Martel suggested further production be halted until July 1939, but the Director General of Munitions Production turned this suggestion down. Furtunately the clutch and brake defects were cured before the end of the year and the first production vehicle was delivered in December 1938.

Early in 1939 a 30 mm armour basis was required so one of the pilots was tried with 20-30 mm armour, and performance was un-impaired by the ½ ton increase in weight. Shortly after 65 more tanks were ordered. Some troubles persisted but the first British Christie type or Cruiser Tank A13. Mk. I as it was known officially at first, proved to be a good tank on the whole when tested in battle in France with the 1st Arm.Div. in 1940.
The up-armoured Cruiser Tank A13 Mk.II was basically the same as the A13 Mk. I but with thicker armour in the nose and turret front and additional armour vee plates on the turret sides and which were in effect, spaced armour. Some of the earlier A13 Mk.I vehicles were later re-worked to approx. the same standards by the addition of the vee plates and spaced turret front, (the Bovington Tank Museum exhibit T 4422 (HMC 774) is such an example) but some re-worked models also had additional armour to 'box in' the gun mantlet.
Considerable confusion arose over the nomenclature of these tanks for they were commonly referred to as 'A13's' regardless as to whether they were Mk.I or Mk.II types so the War Office put out an instruction to clarify the position.

Cruiser Tank A13.Mk.I was re-designated Cruiser Tank Mk.III
Cruiser Tank A13.Mk.II was re-designated Cruiser Tank Mk.IV.

Armament of Cruisers Mk.III and IV. was a 2-pdr gun and co-axial .303 Vickers water-cooled machine-gun. A Mk.IVA Cruiser was produced with a 7.92 mm Besa machine-gun in place of the Vickers and was also available in limited numbers as a Close Support tank with a 3" howitzer in place of the 2-pdr.

The hull was of riveted construction and was divided into three main compartments. The Driver occupied the front compartment. The Fighting compartment, immediately behind the Driver was occupied by the Commander, Gunner and Loader. The Nuffield-Liberty engine was mounted longitudinally at the rear of the vehicle. Electric starting was employed although an alternative method used compressed air from a storage cylinder injected into the engine cylinders. A small compressor driven by the engine maintained the supply. The system was not a success for cold air injected into a hot engine sometimes caused the piston crowns to crack. The drive was transmitted from the engine to the 4F and 1R speed gearbox via a multiplate dry clutch. An output shaft either side of the gearbox took the drive through the steering clutches and brake, a spur type wheel and pinion final drive gear to a 20 tooth twin ring sprocket driving a 9.6" wide track. Four double cushion rubber tyred road wheels 32" dia. each with a trailing arm controlled independently by a fully enclosed coil spring and a telescopic double-acting hydraulic shock absorber. The complete suspension assembly was mounted between the inner and outer skins of the hull.

Two new gun mantlets were introduced on the Mk.IV A model. Later models had circular cupolas instead of the earlier octagonal type.

Reworked Cruiser Mk.III (A13.Mk.I) vehicles existed in various stages of up-armouring and these stages are tabulated below.

a) Additional armour to the hull nose plate. When this stage was introduced the rivet pattern was similar to that on the Cruiser Mk.IV A.

b) Additional spaced armour turret front plate. Shown dotted on hull profile drawing.

c) Spaced armour vee plates added to turret sides and rear.

d) Mantlet 'boxed in' with spaced armour.

Re-working could include any or all of the above stages. If all the stages had been carried out the appearance would have been similar to the production Cruiser Mk.IV, excepting that the latter had the turret front plate at the original angle of slope as indicated by the solid line on the hull profile drawing.

Production was as follows

Christie Cruiser			MEE 1146
A13.E1	T 2086	EXH 841	MEE 958
A13.E2	T 2085	HMH 997	MEE 1077
A13.E3	T 3642	HMH 998	MEE 1147

65 Ordered Jan.
T 4385 - T 4449 (
65 Ordered Jan.1
T 7030 - T 7060 (
T 7061 - T 7094 (
95 Ordered
T 9096 - T 9159
T 9160 - T 9190
80 Ordered
T 15215 - T 15294
65 Ordered
T 18096 - T 18130
T 18131 - T 18160

TOTAL 370

A Cruiser
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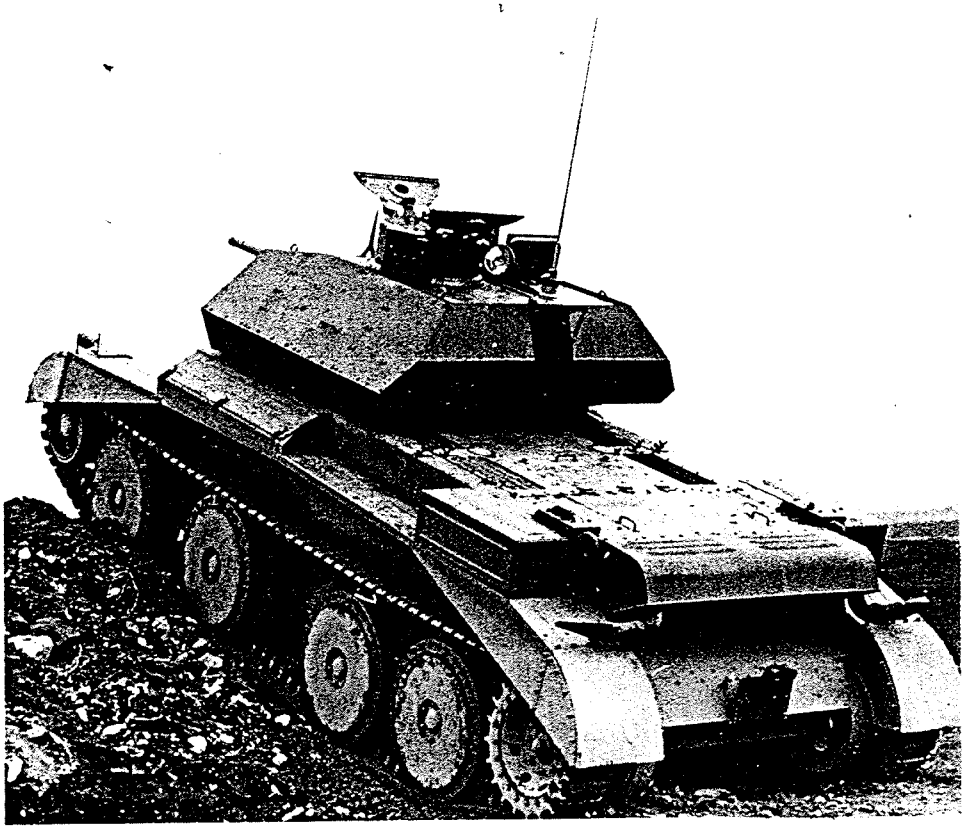
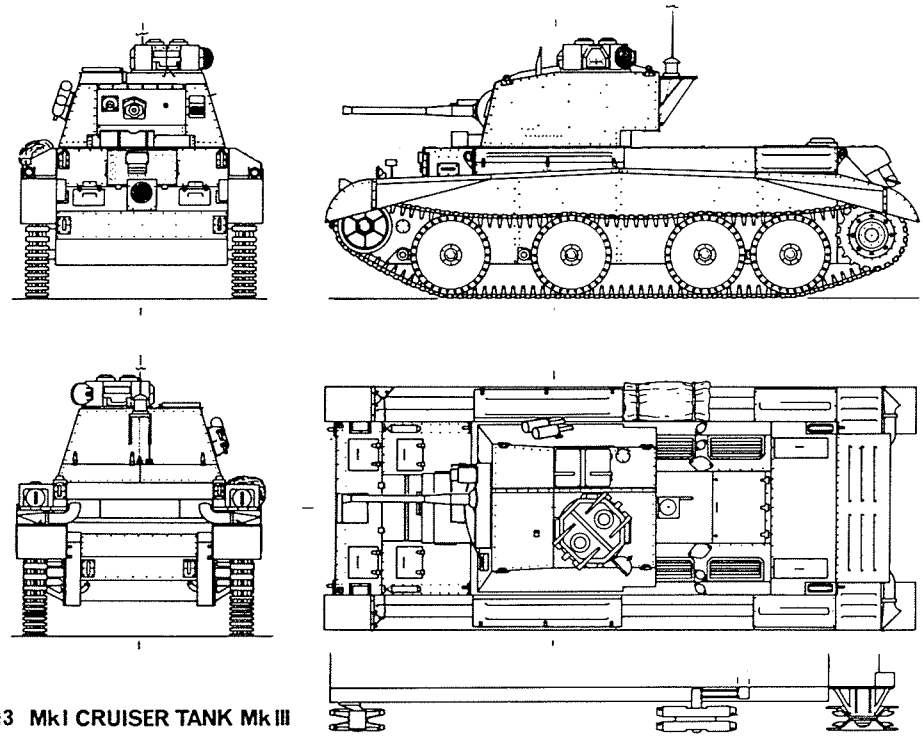
65 Ordered Jan. 1938
T 4385 - T 4449 (HMC 738-802) Cruiser Mk.III 65 Nuffield M & A
65 Ordered Jan.1939
T 7030 - T 7060 (PMV 386-450) Cruiser Mk.IVA 31 L.M.S.
T 7061 - T 7094 (PMV 386-450) Cruiser Mk.IV 34 L.M.S.
95 Ordered
T 9096 - T 9159 Cruiser Mk.IV 64 Nuffield M & A
T 9160 - T 9190 Cruiser Mk.IVA 31 Nuffield M& A
80 Ordered
T 15215 - T 15294 Cruiser Mk.IVA 80 Nuffield M & A
65 Ordered
T 18096 - T 18130 Cruiser Mk.IV 35 Nuffield M & A
T 18131 - T 18160 Cruiser Mk.IVA 30 Nuffield M & A

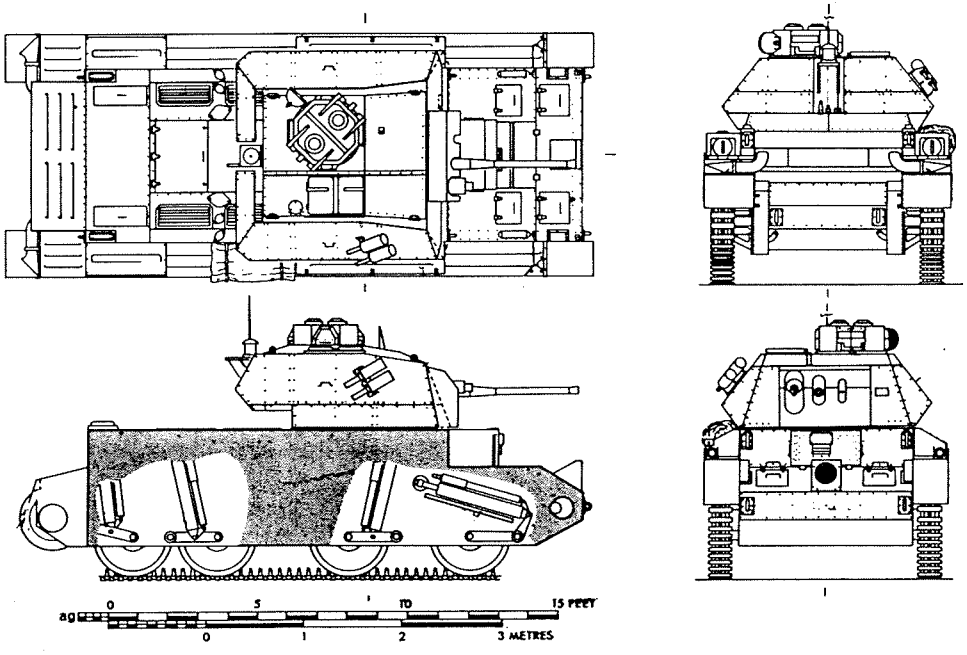
TOTAL 370



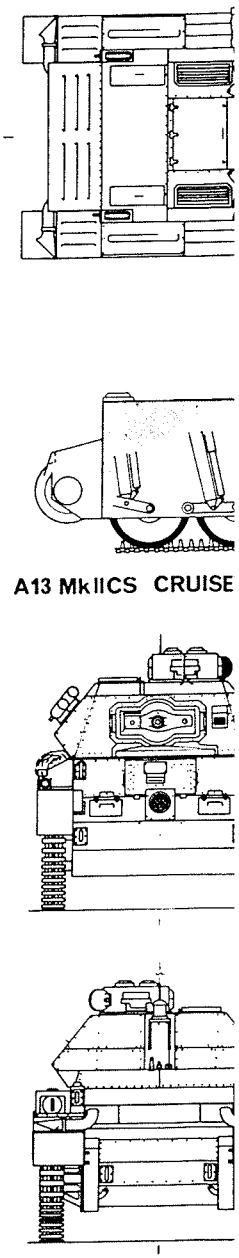
A Cruiser Tank Mark IV or Mark IV A on a test drive. The angled spaced armour fitted to the turret sides and back improved the protection considerably, yet the increased weight of a half ton caused by this and the additional armour on frontal surfaces did not effect the overall performance. The complex shape of the rear hull is clearly seen on this photograph. (Imperial War Museum Photograph)



A 13 Mk I CRUISER TANK Mk III



A13 Mk I CRUISER TANK Mk III (Reworked)



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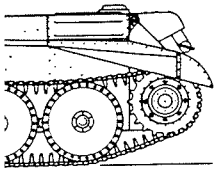
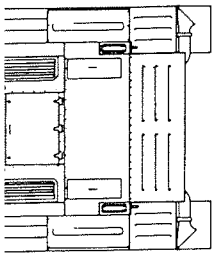
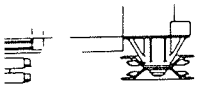
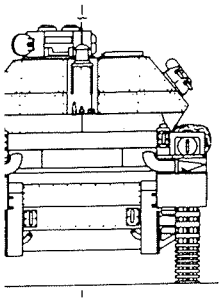
A13 Mk II CRUISER

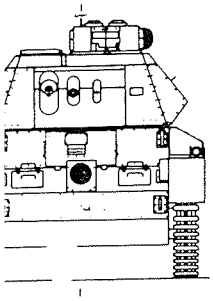
SCALE

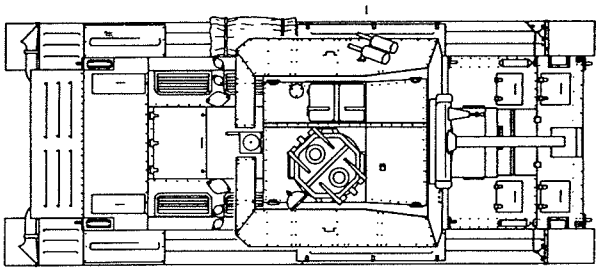


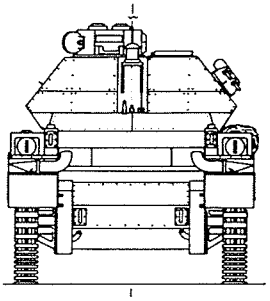


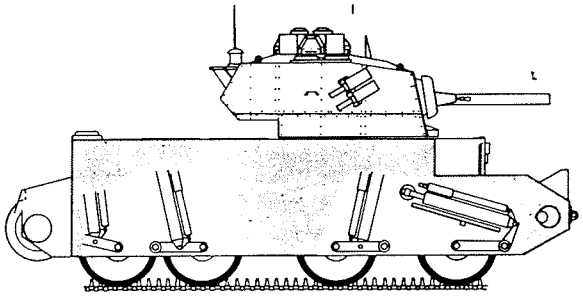


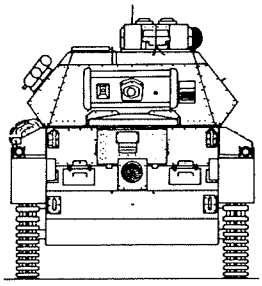




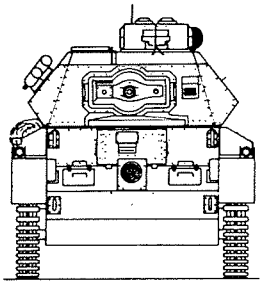


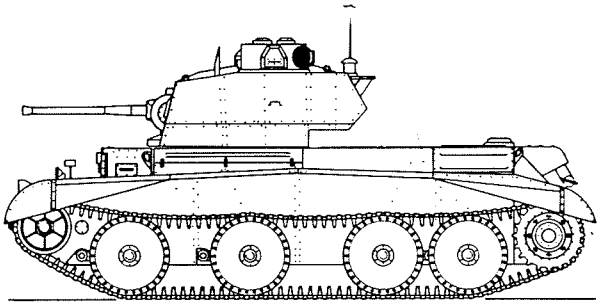


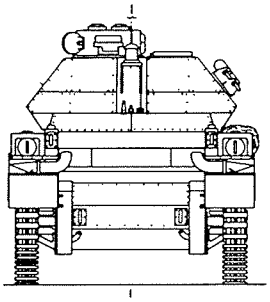


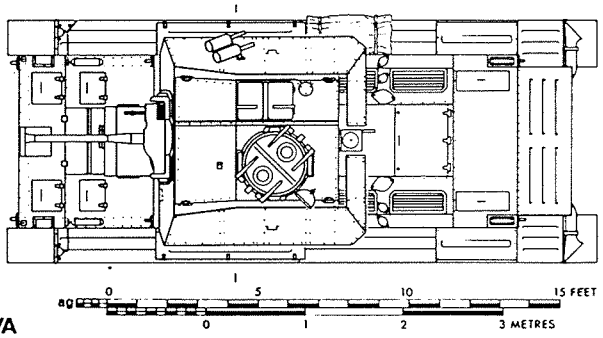


A13 MkIICS CRUISER TANK MkIVA.CS (Early mantlet)



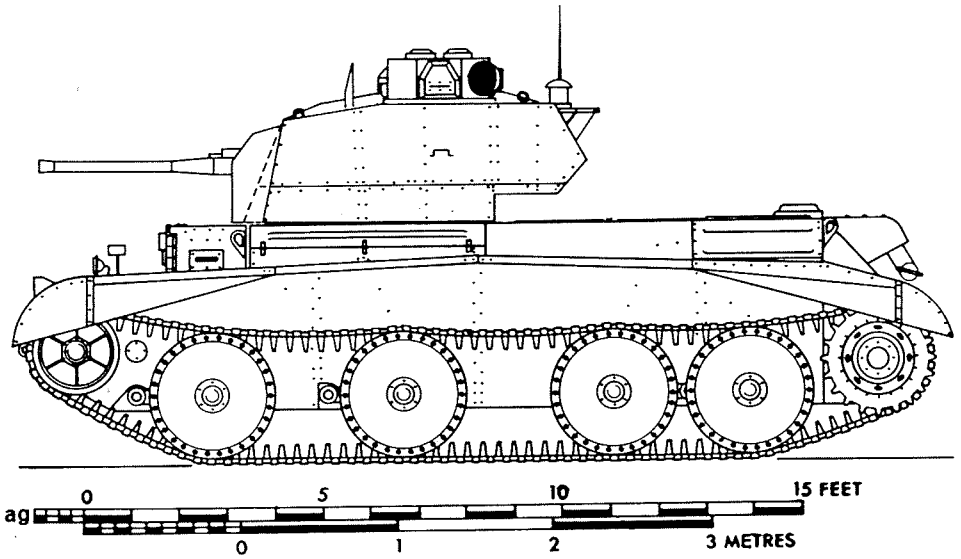






A13 MkII CRUISER TANK MkIVA

SCALE 1:76 (4mm to 1foot) Drawn by A.J. GOOCH



Technical Specification for Cruiser Tank Mk III (A 13 Mk I)

Crew: 4.
Weight, Combat loaded: 31,360 lbs. 14 Long tons. 15.68 Short tons. 13.78 Tonnes.

Performance

Speed, Max. Road:	30 m.p.h. (48 Km.p.h.)
Fording depth:	3' 0" (91.44 cm)
Trench crossing:	7' 6" (228.6 cm)
Step:	2' 6" (76.2 cm)
Min. Turning circle.	Skid.
Ground pressure:	11.7 lbs/sq.ins. (0.823 Kg/sq.cm)
Range (internal fuel), Road:	100 Miles (160.9 Km)
Power to weight ratio:	Gross 24.25 (23.0) ton 24.6 Metric HP/ton.

Dimensions

Length overall:	19' 9" (601.98 cm)
Width overall:	8' 4" (254.0 cm)
Height:	8' 6" (259.08 cm)
Ground clearance:	1' 4" (40.64 cm)
Fire height of gun:	6' 3" (190.5 cm)
Road wheel dia (overall)	2' 8" (81.28 cm)

Trackwork

Centres:	7'6⅔" (230.51 cm)
Length on ground:	11' 6" (350.52 cm)
Width:	9.7" (24.64 cm)
Pitch:	4 1/8"(10.47 cm)
Number of links per track:	119.
Type:	Forged Steel, Dry Pin.

Mechanical Details

Engine:	Nuffield - Liberty Mk I and Mk II. 45 degree V-12 Single OHC, normally aspirated gasoline, spark ignition, Liquid cooled. Compression Ratio 5.2:1 Bore 125 mm x 127 mm (4.92 x 5") Stroke = 27,250 cc (1663 cu.ins)340 BHP @ 1500 RPM
Transmission	Mechanical, 4F & IR speed gearbox.
Steering:	Clutch and Brake.
Suspension:	'Christie' Independent trailing arms, enclosed coil springs, double acting telescopic shock absorbers on all stations.

Armament

Main:	OQF 2-pdr Mk IX - XA
Calibre, and length in calibres:	40 mm (1.574 ins) L/50
Traverse:	360 degrees. Operation: Hydraulic
Elevation:	plus 20 degrees, minus 15 degrees
Secondary armament:	.303" Vickers MG

Stowage:

Ammunition, main armament:	87 rds.
Ammunition, secondary armament:	3750 rds.
Internal Fuel capacity:	110 Imp. gals.132 U.S. gals. 500 Litres.

Armour

14 mm (30 mm) Max. 14 mm Min.

Type:	Riveted Rolled Steel Plates.
Hull, Nose	0.551" (14 mm) at 0 degrees.
Nose lower:	at 60 degrees.
Glasis plate:	at 60 degrees.
Drivers plate:	at 0 degrees.
Sides,	at 0 degrees.
Rear, upper:	at 90 degrees.
Decking:	at 90 degrees.
Engine covers:	at 90 degrees.
Belly:	0.235" (6 mm) at 90 degrees.
Turret	
Front:	0.551" (14 mm) at 7/11 degrees.
Sides:	at 16/38 degrees.
Roof:	at 10/90 degrees.

Technical Specification variation for Cruiser Tank Mk.IV, IVA and IVA CS (A.13 Mk.II, A.13 Mk.IIA, A.13 Mk.II A.C.S.)

Weight, Combat loaded: 33040 lbs. 14.75 Long tons, 16.52 Short tons. 14.5 Tonnes.
Ground pressure: 12.3 lbs/sq.ins.(0.86 Kh/sq.cm)
Power to weight ratio: Gross 23 HP/ton. 23.4 Metric HP/ton.

Armament Mk.IV A.C.S. (A.13 Mk.II A.C.S.)
Main: OQF 3 in. How Mk.I
Calibre, and length in calibres: 76.2 mm (3 ins) L/25.

Secondary Armament: Mk.IV.A 7.92 mm BESA MG

Armour

Hull, Nose upper: 1.810" (30 mm) at 0 degrees.

Turret
Front: 1.810" (30 mm) at 7.11 degrees.

& IR speed gearbox.

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.574 in., .50
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MG

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/11 degrees.
5/38 degrees.
0/90 degrees.

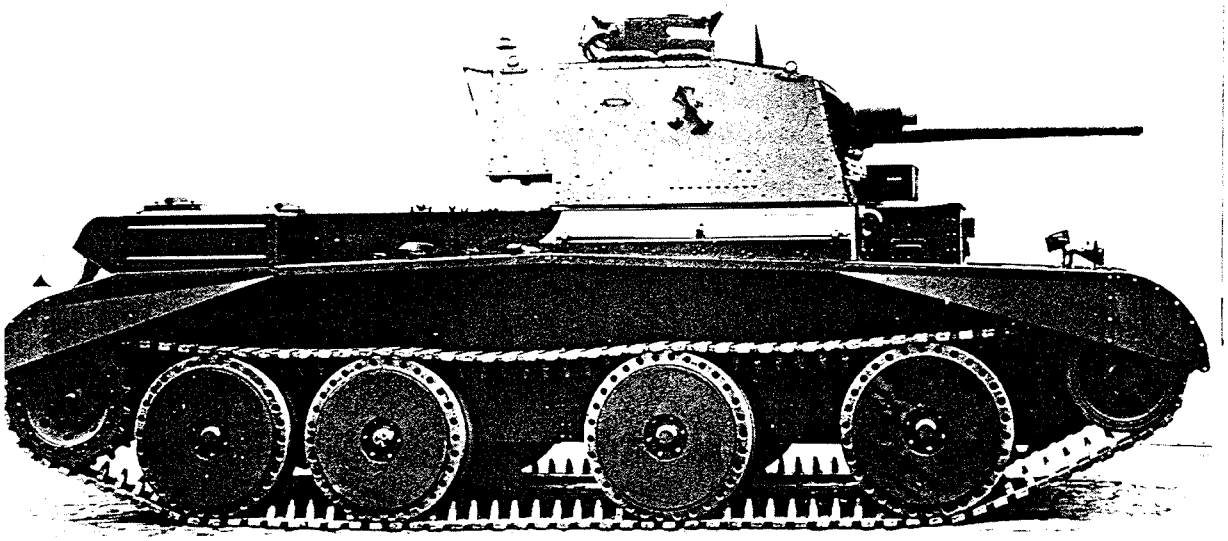
(A.C.S.)

.92 m A MG

mm) at 0 degrees.

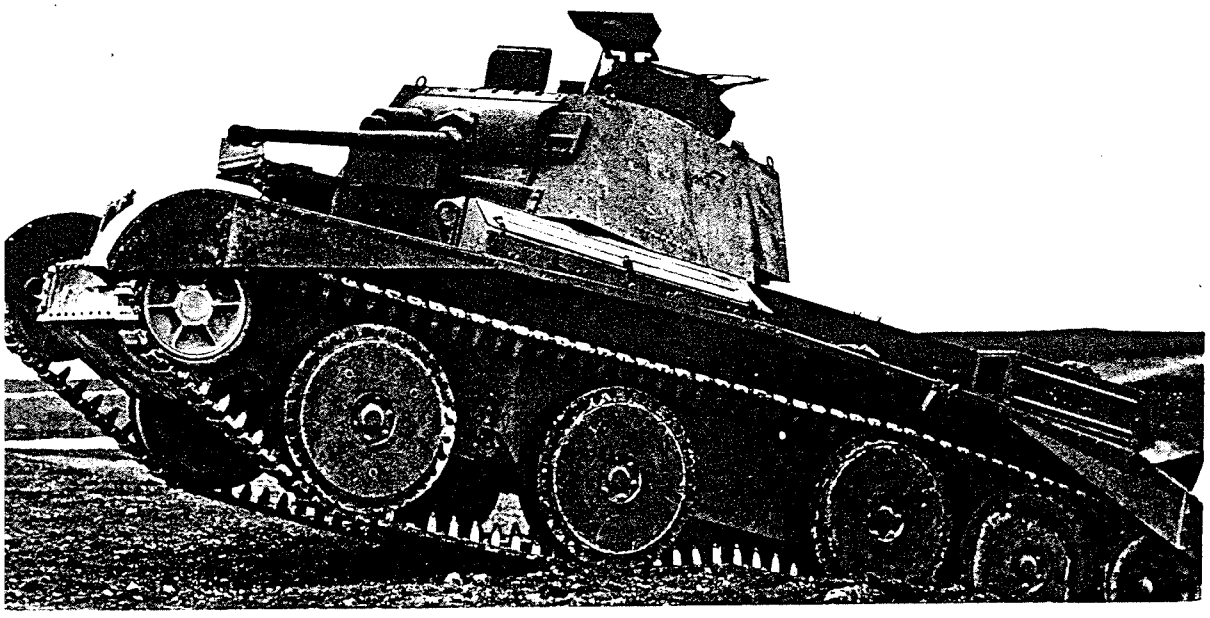
mm) at 7.11 degrees.

The Cruiser Tank Mark IVA differed from previous Marks in that it was armed with a 7.92mm Besa MG in place of the watercooled Vickers machine gun. The nearest two vehicles in our photograph had the early type of mantlet which was later replaced by the cast type seen on the tank in the background It is interesting to note that T 15226 is shown here being towed out of soft ground by T 15227 and T 15243, during exercises in England, while German photographs reveal that T 16228 was destroyed in North Africa during 1942. This latter tank was named "Emperor" and was modifed to suit operational conditions in the desert. Cylindrical water tanks were strapped on the dust-guards behind the stowarge boxes. A rack was mounted behind the final drive unit at the extreme rear of the tank and this appears to have been used for carring either water or petrol cans. Additional sand shields were attached to the dustguards from a point approximately in line with the centre of the second road wheel and these streched to the back. This fitting was very necessary due to the amount of dust raised by these fast tanks when they were travelling at high speed. (Imperial War Museum Photograph)



ABOVE: Right hand side view of the A 13 Mk I, later known as the Cruiser tank Mark III. As can be seen the hull was completely new with Christie type suspension and trackwork. The turret was basically the same as that fitted to the Cruiser Tank Mark I (A9) described in Bellona Prints Series 17.No.65.(UK). The commanders cupola was new and a considerable improvement on that of the earlier tank. The bracket on the side of the turret is for carrying smoke bomb dischargers. (Imperial War Museum Photograph)

BELOW: A Cruiser tank Mark III under test to demonstrate it's mobility. Some troubles persisted in these tanks, but they proved quite useful when used in action by the 1st Armoured Division in France during May 1940. (Imperial War Museum Photographs)



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